

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-210922

(43)Date of publication of application : 03.08.2001

(51)Int.Cl.

H05K 1/02

(21)Application number : 2000-014440

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(22)Date of filing : 24.01.2000

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(54) PRINTED WIRING BOARD AND MOUNTING STRUCTURE THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a mounting structure which can prevent the occurrence of radiation noise which occurs due to the relative positional relation between a printed wiring board and an enclosure.

SOLUTION: This printed wiring board 1 has a ground layer 2 and a power source layer 3 and, at the same time, signal layers 4 and 5 on both sides. The conductor area of the ground layer 2 is made larger than those of the power source layer 3 and signal layers 4 and 5. Ground patterns 7 are respectively arranged on the outer periphery of the signal layer 4 and on the signal layer 5. The patterns 7 and 8 are electrically connected to each other by through holes 9 provided at regular intervals. When the printed wiring board 1 is packaged in the enclosure 6 of an electronic apparatus, the ground pattern 8 is electrically connected to the enclosure 6 through a plurality of posts 10 and the power source layer 3 is surrounded by the ground layer 2, ground patterns 7 and 8, posts 10, and enclosure 6.

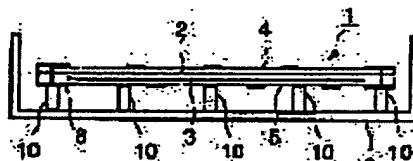


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[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

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X NCIP1 English language
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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the printed wired board which prevents a radiated noise, and the mounting structure to the electronic equipment.

[0002]

[Description of the Prior Art] The approach of making multilayer structure the printed wired board mounted in electronic equipment as an approach of generally preventing the unnecessary electromagnetic wave noise generated from electronic equipment and an outpatient department electromagnetic wave noise is taken. Moreover, generally a metal is used and the case of electronic equipment has the structure of wrapping in a printed wired board. However, since it is impossible to carry out full sealing of the case and an electromagnetic wave will be emitted from the clearance between cases, the shielding effect by the case was what is not so much expectable.

[0003] As this cure, the approach of connecting electrically the grand layer (signal ground) of a printed wired board with a metal case is enforced.

[0004]

[Problem(s) to be Solved by the Invention] However, with the configuration which only connected the grand layer of a printed wired board with the metal case electrically, although reduction of a radiated noise could be aimed at to some extent, the problem that it will not be obtained and the radiated noise of an unexpected frequency will increase had effectiveness to the extent that it expects. Although there are radiation from the signal pattern of a printed wired board, radiation from between a voltage plane and a grand layer, and radiation from the cable connected to electronic equipment as a generating factor of the radiated noise from electronic equipment and the cure is separately taken to these radiation, the new radiation generated with the relative-position relation between a printed wired board and a case exists, and, generally the analysis and the cure of a factor to this radiation are not yet performed.

[0005] Moreover, the printed wired board mounted in actual equipment was not necessarily restricted in one sheet, but since two or more patchboards relayed a connector and a cable and were connected, it also had the problem of also producing the new radiation by the relative-position relation of these printed wired boards.

[0006]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, in the printed wired board mounting structure of mounting the printed wired board which has a voltage plane and a grand layer in electronic equipment, this invention prepares the conductor which connects said grand layer with the metal case of said electronic equipment electrically, and is characterized by surrounding said voltage plane with said grand layer, said conductor, and said case. The large signal plane of a noise is arranged within limits surrounded with a grand layer, a conductor, and a case.

[0007]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained according to a drawing. The side-face explanatory view in which drawing 1 shows the mounting

structure of the printed wired board of the gestalt of the 1st operation, the side-face explanatory view in which drawing 2 shows the printed wired board of the gestalt of the 1st operation, and drawing 3 are the explanatory views showing the printed wired board of the gestalt of the 1st operation.

[0008] In drawing, the printed wired board 1 of the gestalt of the 1st operation is a four-layer printed wired board, and it has signal planes 4 and 5 on the front reverse side while it has the grand layer 2 and a voltage plane 3. The conductor-side product of the grand layer 2 is larger than the conductor-side product of a voltage plane 3 and signal planes 4 and 5. Moreover, the signal plane 4 is wired in a signal with small noise radiation, for example, an analog system signal, and the signal plane 5 of the opposite side is preferentially wired in a clock signal and a bus signal with a comparatively large radiated noise. When a printed wired board 1 is mounted in the case 6 of equipment, it is mounted so that a signal plane 5 side may counter a case 6. The case 6 is constituted by the metal.

[0009] The grand pattern 7 is arranged at the periphery of the signal plane 4 whose number is the 1st, and the grand pattern 8 is arranged also at the signal plane 5 whose number is the 4th. The grand pattern 7 and the grand pattern 8 are electrically connected by the through hole 9 prepared at equal intervals. Spacing of a through hole 9 is set as $1/6$ wave with a wavelength [of the upper limit (1GHz) of radiated-noise specification] of 30cm of 5cm or less.

[0010] When it mounts the printed wired board 1 of the gestalt of the 1st operation in the case 6 of electronic equipment, the metal post 10 of the conductor which connects electrically the metal case 6 and the grand pattern 8 by the side of a signal plane 5 is formed.

[0011] The voltage plane 3 of a printed wired board 1 and the signal plane 5 which wired the large signal of a radiated noise will be surrounded by the above configuration with the grand layer 2, a through hole 9, the grand pattern 8, the metal post 10, and a case 6. Therefore, radiation of the noise from between a voltage plane 3 and the grand layers 2 and the radiation from the signal pattern of a signal plane 5 can be controlled. A shielding effect improves by making spacing of the metal post 10 small.

[0012] Next, the gestalt of the 2nd operation is explained. The side-face explanatory view in which drawing 4 shows the printed wired board of the gestalt of the 2nd operation, the side-face explanatory view in which drawing 5 shows the mounting structure of the printed wired board of the gestalt of the 2nd operation, and drawing 6 are the perspective views showing the mounting structure of the gestalt of the 2nd operation.

[0013] In drawing, the voltage plane 12 has the almost same magnitude as the grand layer 2 by the printed wired board 11 of the gestalt of the 2nd operation. The configuration of the other printed wired boards 11 is the same as that of the thing of the gestalt of the 1st operation. That is, the grand patterns 7 and 8 are arranged at the periphery of the signal planes 4 and 5 of a front flesh side, and both the grand patterns 7 and 8 are connected by the through hole 9. Moreover, a through hole 9 connects both the grand patterns 7 and 8 and the grand layer 2. A signal with a comparatively large radiated noise is wired at a signal plane 5 side.

[0014] When it mounts the printed wired board 11 of the gestalt of the 2nd operation in the case 13 of electronic equipment, the flank of a case 13 is bent so that it may hang over a printed wired board 11 in part, and the metal post 15 of the conductor which connects electrically this bending section 14 and the grand pattern 7 is formed. With the gestalt of the 2nd operation, since a voltage plane 12 exists also in the outside of a through hole 9, it is made to perform electrical installation with the case 13 in the metal post 15 through the grand pattern 7 of the opposite side of a voltage plane 12 to the grand layer 2.

[0015] The voltage plane 12 of a printed wired board 11 and the signal plane 5 which wired the large signal of a radiated noise will be surrounded by the above configuration with the grand layer 2, a through hole 9, the grand pattern 7, the metal post 15, and a case 13. Therefore, radiation of the noise from between a voltage plane 12 and the grand layers 2 and the radiation from the signal pattern of a signal plane 5 can be controlled. A shielding effect improves by making spacing of the metal post 15 small. Moreover, it is not necessary to make a voltage plane 12 smaller than the grand layer 2, and, according to this configuration, the conventional printed wired board is usable as it is.

[0016] In the gestalt of the 2nd operation, since the flank of a case 13 is bent inside, as compared with

the magnitude of a printed wired board 11, the area of opening of a case 13 becomes small, and the workability in the case of mounting a printed wired board 11 worsens. The case structure for solving this problem is shown in drawing 7.

[0017] The case 16 is made into the structure of having the disengageable bottom surface part 17, in drawing 7. Where the bottom surface part 17 is separated from a case 16, a printed wired board 11 is mounted in a case 16, and the bottom surface part 17 is attached in a case 16 with a screw 18 after that. Thereby, the workability of mounting improves.

[0018] Although the gestalt of the above-mentioned implementation explained the case where the number of printed wired boards was one, this invention can be applied also when two or more printed wired boards are mounted. The gestalt of the 3rd operation shows the mounting structure in the case of mounting two or more printed wired boards. Drawing 8 thru/or drawing 11 are the side-face explanatory views showing the mounting structure of the printed wired board by the gestalt of the 3rd operation.

[0019] drawing 8 -- it is and two printed wired boards 11 and 21 are mounted in the case 6. One printed wired board 11 is the main patchboard, and has the same structure as the thing of the gestalt of implementation of the above 2nd. A printed wired board 21 is mounted in parallel to the main printed wired board 11 through a connector 22, and the surface patterns 23 and 24 are grand patterns. A through hole 27 is established in the grand patterns 23 and 24, and both the grand patterns 23 and 24 of each other are connected to them in the periphery of a printed wired board 21. Moreover, the printed wired board 21 has the structure of having a voltage plane 28 among both the grand patterns 23 and 24.

[0020] The upper grand pattern 23 is electrically connected with the flank of a case 6 by the conductor 25. The conductor 25 is continued and formed in the whole grand pattern 23. On the other hand, the grand pattern 7 of the main printed wired board 11 top is electrically connected with the flank of a case 6 with the conductor 26. A conductor 26 is continued and formed in some grand patterns 7, and is connected with another conductor 25.

[0021] By the above configuration, the voltage plane 12 of the main printed wired board 11, a signal plane 5, and the voltage plane 28 of a printed wired board 21 will be surrounded by the grand layer 2, a through hole 9, the grand pattern 7, a conductor 26, a case 6, a conductor 25, the grand pattern 23, and the through hole 27. Therefore, radiation of the noise from between the voltage plane of both the printed wired boards 11 and 21 and grand layers and the radiation from the signal pattern of a signal plane can be controlled.

[0022] Drawing 9 and drawing 10 show the case where one printed wired board is mounted perpendicularly. In drawing 9 and drawing 10, two printed wired boards 11 and 31 are mounted in the case 6. One printed wired board 11 is the main patchboard, and has the same structure as the thing of the gestalt of implementation of the above 2nd. A printed wired board 31 is perpendicularly mounted to the main printed wired board 11 through a connector 32, and the surface patterns 33 and 34 are grand patterns. A through hole 35 is established in the periphery of the grand patterns 33 and 34, and both the grand patterns 33 and 34 of each other are connected to it in the periphery of a printed wired board 31. Moreover, the printed wired board 31 has the structure of having a voltage plane 36 among both the grand patterns 33 and 34.

[0023] The grand pattern 7 of the main printed wired board 11 top is electrically connected with the flank of a case 6 with the conductor 37. The conductor 37 is continued and formed in the perimeter of the main printed wired board 11.

[0024] By the above configuration, the voltage plane 12 of the main printed wired board 11, a signal plane 5, and the voltage plane 36 of a printed wired board 31 will be surrounded by the grand layer 2, a through hole 9, the grand pattern 7, a conductor 37, a case 6, the grand patterns 33 and 34, and the through hole 35. Therefore, radiation of the noise from between the voltage plane of both the printed wired boards 11 and 31 and grand layers and the radiation from the signal pattern of a signal plane can be controlled.

[0025] Drawing 11 shows the case where the printed wired board of another side is mounted in the side face of one printed wired board. In drawing 11, two printed wired boards 11 and 41 are mounted in the case 6. One printed wired board 11 is the main patchboard, and has the same structure as the thing of the

gestalt of implementation of the above 2nd. A printed wired board 41 is mounted in the side face of the main printed wired board 11 through a connector 42, and has become the grand pattern with which the surface patterns 43 and 44 were formed in the periphery. A through hole 45 is established in the grand patterns 43 and 44, and both the grand patterns 43 and 44 of each other are connected to them in the periphery of a printed wired board 41. Moreover, the printed wired board 41 has the structure of having a voltage plane 46 among both the grand patterns 43 and 44.

[0026] The grand pattern 44 of the connector 42 and the opposite side of a printed wired board 41 is electrically connected with the flank of a case 6 by electric conduction 7. The conductor 47 is continued and formed in the whole upper part of the grand pattern 44. On the other hand, the grand pattern 7 of the main printed wired board 11 top is electrically connected with the flank of a case 6 with a conductor 48, and the conductor 47 and the conductor 48 are connected.

[0027] By the above configuration, the voltage plane 12 of the main printed wired board 11, a signal plane 5, and the voltage plane 46 of a printed wired board 41 will be surrounded by the grand layer 2, a through hole 9, the grand pattern 7, a conductor 48, a case 6, a conductor 47, the grand patterns 44 and 43, and the through hole 45. Therefore, radiation of the noise from between the voltage plane of both the printed wired boards 11 and 41 and grand layers and the radiation from the signal pattern of a signal plane can be controlled.

[0028] Although the printed wired board of four layers was made into the example and the gestalt of each above-mentioned implementation explained it, it cannot be overemphasized that this invention is applicable also to the printed wired board of six layers or eight layers with still more number of layerses. Moreover, by preparing a signal pattern in a metal case side to a grand layer, the depressor effect of a radiated noise improves further. Furthermore, although this invention can be applied also when it mounts two or more printed wired boards, and it mounts the printed wired board of three or more sheets, the depressor effect of a radiated noise improves by preparing the signal pattern of all the patchboards to mount between a grand layer and a metal case.

[0029]

[Effect of the Invention] The grand pattern which was formed in the periphery of the surface of a printed wired board according to this invention as explained to the detail above, The conductor which connects electrically the metal case and metal grand pattern of electronic equipment is prepared. Since a grand layer is connected with a grand pattern and the voltage plane or the signal plane was surrounded with the grand layer, the grand pattern, the conductor, and the case Radiation of the noise from between the voltage plane of a printed wired board and grand layers and the radiation from the signal pattern of a signal plane can be controlled.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the side-face explanatory view showing the mounting structure of the printed wired board of the gestalt of the 1st operation.

[Drawing 2] It is the side-face explanatory view showing the printed wired board of the gestalt of the 1st operation.

[Drawing 3] It is the explanatory view showing the printed wired board of the gestalt of the 1st operation.

[Drawing 4] It is the side-face explanatory view showing the printed wired board of the gestalt of the 2nd operation.

[Drawing 5] It is the side-face explanatory view showing the mounting structure of the printed wired board of the gestalt of the 2nd operation.

[Drawing 6] It is the perspective view showing the mounting structure of the gestalt of the 2nd operation.

[Drawing 7] It is the side-face explanatory view showing other case structures of the gestalt of the 2nd operation.

[Drawing 8] It is the side-face explanatory view showing the mounting structure of the printed wired board of the gestalt of the 3rd operation.

[Drawing 9] It is the side-face explanatory view showing the mounting structure of the printed wired board of the gestalt of the 3rd operation.

[Drawing 10] It is the perspective view showing the mounting structure of the printed wired board of the gestalt of the 3rd operation.

[Drawing 11] It is the side-face explanatory view showing the mounting structure of the printed wired board of the gestalt of the 3rd operation.

[Description of Notations]

- 1 Printed Wired Board
- 2 Grand Layer
- 3 12 Voltage plane
- 4 Five Signal plane
- 6 Case
- 7 Eight Grand pattern
- 9 Through Hole
- 10 Post

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